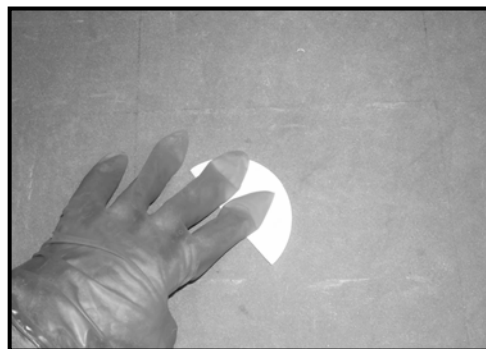


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1.0 Purpose & Scope

This document describes a field procedure for taking wipe samples of potentially contaminated surfaces. It is based on methodology described in NIOSH 9100 "Lead in Surface Wipe Samples" of the NIOSH Manual of Analytical Methods.

The goal of the procedure is to provide a uniform methodology to collect representative samples of surface contamination of particulates or low volatility liquids. Using this method will ensure repeatability between various sampling personnel and between surface configurations. This method is appropriate for collection of Lead, Beryllium, other particulates, metals, and low volatility liquid contaminants. The use of this procedure for Polychlorinated Biphenyl (PCB) is limited to circumstances involving OSHA compliance testing. (Compliance sampling for EPA clearance levels at spills and remediation sites require the use of Environmental Services Division EM-SOP-PCB.)

2.0 Responsibilities

- 2.1 Demonstrated Competency:** This procedure is administered through the SHSD Industrial Hygiene Group. It is implemented through members of the SHSD Industrial Hygiene Group, the Radiological Control Division Facility Support group, and other BNL ESH&Q related organizations. Only persons who have demonstrated competency in performing this procedure in accordance with Section 4 are authorized to use this procedure.

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2.2 **Chain of Custody procedures:** The collector of the sample is responsible for the integrity of the sample until the sample has been properly transferred to the IH Group laboratory using the SHSD established *Chain of Custody IH51300* procedures. It is permissible to use this procedure to collect samples that will be analyzed by a laboratory not associated with the IH Group. However, to have the data included in the SHSD IH group databases, approval of the data by the IH Group Leader or his/her designee is required. Approval will be contingent on documentation that appropriate sampling and analysis procedures were followed and the submittal of an appropriate *Chain of Custody*, analysis report, and any other requested documentation to the IH group.

2.3 **Hazard Analysis of the Sampling Task:** It is the responsibility of the person using this method and his/her supervisor to ensure that the appropriate personal protective equipment is worn while performing this procedure. See section 5.2 and Table 1. In addition, the person performing this procedure and his/her supervisor are responsible to ensure that all required training and qualification for hazards that may be present in areas where this procedure will be used have been met. The person performing this procedure and his/her line supervisor are responsible to comply with all work planning and work permit system requirements.

3.0 Definitions

- 3.1 **ACGIH TLV:** American Conference of Governmental Industrial Hygienist Threshold Limit Value- a DOE mandated occupational exposure limit.
- 3.2 **OSHA PEL:** Occupational Safety and Health Administration Permissible Exposure Limit- a DOE mandated occupational exposure limit.
- 3.3 **Program Administrator:** A person designated by the IH Group Leader or SHSD management to administer this procedure and the associated program of wipe sampling data management.
- 3.4 **Qualified Sampler:** A person who has demonstrated competency, in accordance with Section 7, to perform this field procedure.

4.0 Prerequisites

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Persons using this SOP must meet the qualification criteria in Section 7.

5.0 Precautions

- 5.1 **Hazard assessment:** The actual task of taking a surface wipe sample typically does not cause significant employee health risks. However, the technique can involve risk if the solvent used is hazardous. By its very nature, this SOP may be performed in areas with chemical or radiological contamination, and these hazards must be assessed on a case-by-case basis. No one is to perform Surface Wipe sampling until the hazards of the area have been assessed by a competent individual knowledgeable of the hazards of the area.
- 5.2 **Personal Protective Equipment:** Appropriate personal protective equipment to protect the person collecting the sample must be used when implementing this procedure. At a minimum, disposable gloves must be used when contacting the surface material and handling exposed sampling media. The gloves must have sufficient impermeability to the surface contaminant and solvent used on the collection media to allow safe handling. See Table 1. Where the potential for contamination of the body can occur, the use of disposable clothing to cover the areas of contact is required. When the potential for exposure to airborne contaminants above the ACGIH TLV, STEL or Ceiling or OSHA PEL (which ever is lower) may occur, the person collecting the sample must use appropriate respiratory protection in compliance with the BNL Respiratory Protection Program.
- 5.3 **Radioactive Contamination:** It is possible that some surfaces to be tested may have radioactive contamination as well as the chemical contamination. In these cases, personal protective equipment and administrative controls must be implemented for the radiological contaminant hazard in addition to the chemical hazard. In addition, the collected sample must be analyzed for the radiological hazard before it can be submitted to the IH Group for analysis. The radiological contamination must be below the permissible release limits to the general public. See FS SOP-1005.
- 5.4 **Work Planning:** All requirements of work permits and work planning system reviews must be met in performing this procedure.
- 5.5 **Environmental Impact and Waste Disposal:** This technique does not have adverse impact on the environment. The sampling media used in this technique that may have hazardous chemical involved is processed to a laboratory for analysis. Any unused

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solvents, templates, and gloves that are to be discarded must be disposed of in accordance with Waste Management Division directions and procedures.

6.0 Procedure

6.1 Equipment

Sample container (either):	Bag, plastic, sealable with "zip" type seal.
	Vial, glass or plastic. (Glass is needed for hexane solvents based samples).
Sample media (any of these)	Gauze: 2" x 2" or 4" x 4" cotton gauze
	Paper: Ashless quantitative filter paper (typical diameter is 1.5 to 4 inches)
	Pre-moistened wipe: manufacturer foil wrapped, solvent soaked disposable cloths (An acceptable brand is the GhostWipes™; via Environmental Express.)
Gloves	Appropriate for contaminant and solvent (see Table 1) and site hazards.
Solvent	Distilled water, iso-propanol, ethanol, methanol, n-hexane, or pre-moistened. See Table 1 for recommended solvent for each contaminant.
Template	Plastic sheet or cardboard: See Table 1 for size needed - 100cm ² : 10 cm x 10 cm square –or- circle of 11.24 cm diameter. - 1ft ² : 1foot x 1 foot, or other shape totaling 144 in ² .

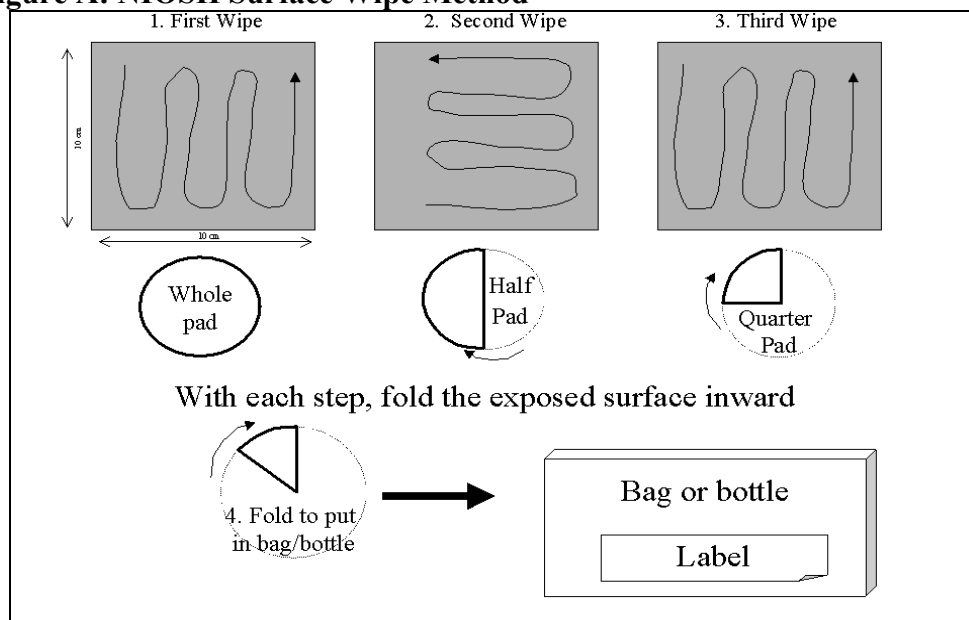
6.2 **Surface Wipe Technique:** BNL SHSD IH Group has selected the NIOSH method of collecting wipe samples. For uniformity, this method should be used for all sampling. **surface to be sampled (Visual depicted in Figure A)**

- 6.2.1 Moisten the sample media with 1 to 2 ml of the appropriate solvent (see **Table 1**) or use pre-moistened wipe. Apply only enough solvent to moisten approximately 80% of the area of the media. Avoid excess solvent on the filter or pad as it may cause drips and running on the surface thus diluting the sample.
- 6.2.2 Place the template over the area to be sampled or measure out 1 ft² or 100-cm² surface area. If the object has a total surface area of less than 1 ft² or 100 cm², sample the whole surface area, if possible, and record the surface area. If the surface does not allow the use of a template, carefully determine the dimensions that will equal 1 ft² or 100 cm².
- 6.2.3 Wipe the surface with firm pressure, using 3 or more S-strokes (in one direction, covering the entire surface). Fold the exposed side of the pad or filter inward (i.e. fold in half). [If the surface is very rough, a dabbing action may be substituted for the S-stroke wipe. Indicate dabbing done on **Attachment 9.1**]

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- 6.2.4 Using the once-folded media, wipe the same area with S-strokes at right angles to the first wipe. Fold the exposed side of the pad or filter in.
- 6.2.5 Using the twice-folded media, wipe with S-strokes in the original direction. Fold the exposed side of the pad or filter in.
- 6.2.6 Place the media in a plastic bag or vial. Seal the zip lock or vial. Record the sample identification on the bag or vial.
- 6.2.7 Thoroughly clean reusable templates or discard paper templates in preparation of the next sample. Based on WMD testing of similar material, templates can be disposed as normal trash.
- 6.2.8 Remove gloves and discard appropriately before handling the next filter or pad. Based on WMD testing of similar material, templates can be disposed as normal trash.
- 6.2.9 Record the sample identification, surface area sampled, and description of the sample and surface on the sample form in **Attachment 9.1**.
- 6.2.10 Include 1 blank filter or pad (moisten and placed in bags or vials) with each set of samples (provide 1 blank per 6 samples).

Figure A: NIOSH Surface Wipe Method



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Table 1

Contaminant	Media	Solvent ⁽¹⁾	PPE Glove ⁽²⁾ Disposable Style	Sample Size
Lead	Gauze or Filter	Distilled Water	Natural Latex Rubber, Nitrile, PVC, or Polyethylene	1 square foot, 100 cm ² requires advanced approval by IH professional verifying that sensitivity is adequate
	GhostWipe™ (should be cut in half) ⁽³⁾	Wipe is premoisten (Water & Benzalkonium Chloride)		
Beryllium	Gauze or Filter	Distilled Water	Natural Latex Rubber, Nitrile, PVC, or Polyethylene	1 square foot minimum needed always
		Isopropanol, Methanol, Ethanol		
	GhostWipe™ (should be cut in half) ⁽³⁾	Wipe is premoisten (Water & Benzalkonium Chloride)		
Arsenic Cadmium Chromium, or Nickel	Gauze or Filter	Distilled Water	Natural Latex Rubber, Nitrile, PVC, or Polyethylene	100 cm ² typically acceptable
	GhostWipe™ (should be cut in half) ⁽³⁾	Wipe is premoisten (Water & Benzalkonium Chloride)		
PCB⁽⁴⁾	Gauze Pad	Iso-octane, n-hexane, cyclohexane	Natural Latex Rubber, Nitrile, Neoprene	100 cm ² typically acceptable
PNAH	Filter	Hexane	Nitrile, Neoprene	100 cm ² typically acceptable

Media and solvents described in Reference 9.4.

Notes for Table 1:

(1) Solvent: The solvent is not critical for lead, beryllium, and most heavy metals such as cadmium, nickel, and chromium. In doing wipes for these compounds, it is allowable to choose the solvent that will have the least impact (residues) on the owner of the equipment being sampled (i.e. some equipment is sensitive to water residues and an alcohol or other solvent may be preferred by the equipment owner.)

(2) Selection criteria: Breakthrough time greater than 1 hour of continuous contact. Source of data is *DOE Guidelines for the Selection of Chemical Protective Clothing, 1991*.

(3) The use of full size GhostWipes™ for may cause the sample to not meet the minimum level of detection. To increase sensitivity, cut GhostWipes™ in half to reduce the size of the wipe.

(4) The use of this procedure for Polychlorinated Biphenyl (PCB) is limited to circumstances involving OSHA compliance testing. (Compliance sampling for EPA clearance at spills and remediation sites requires the use of Environmental Services Division EM-SOP-PCB.)

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6.3 Sampling Technique: Determining HOW MANY samples to take. It is not possible to provide definitive guidance on the number of samples to be taken in every case. **Table 2** provides general guidance on which to base professional judgment in determining the number of samples. Factors that should be considered in selecting the number of replicate samples to be taken include: the size of the area to be tested, the predicted uniformity of contamination over the surface area, and the eventual fate of the surface area (disposal, remediation, background measurement, etc.)

If more than six (6) samples are to be taken, it is suggested that at least one (1) duplicate sample be taken in close proximity to one other to verify the precision (repeatability) of the sampling.

Table 2

Surface Configuration	Minimum Number of Samples	Qualifier
Entire Surface is less than 100 cm ² (example: a small article)	1	If possible, sample the whole item, one sample is usually sufficient.
Surface Area of object or area is greater than 100 cm ² but only a few square feet (example: table top on which a process is done)	1	If only one sample is taken, select the area with highest potential contamination
Surface Area of object or area is greater than a few square feet (example: floor or wall of a room)	1 - 3	Ideally three samples are taken, but fewer samples may be taken depending on the response action and purpose for sampling
Multiple surfaces are present in an area with the same exposure potential to source (example, many rooms in a building with a common source such as the HVAC system)	1 – 3 for each unique surface type, 3 in a representative location and, 6 or more for the whole area	Assumes all the surfaces have similar exposure potential, else treat each area separately.

6.4 Sampling Technique: Determining WHAT KIND of samples to take when assessing the contamination of an object, spill site, or work area, and characterizing levels on exposed surfaces is the main focus of sampling. However, it may be appropriate to take wipes of the other surfaces, such as:

- surfaces that hazardous objects rest on,
- inside of storage drawers and cabinets,
- areas where workers predominately spend time or frequently access,
- sources of the contamination (such as process equipment, lab apparatus),
- areas where contamination is not expected (serves as a control), and

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- areas where contamination would not be permissible (such as lunch rooms and offices).

6.5 Results interpretation: Sampling results from the laboratory should be normalized to the base units of the Acceptable Surface Contamination Level's (ASCL) reported value. The limits are listed in **Table 3**.

6.6 Reporting results: The assessment of results of surface wipe sampling should be conveyed to the requestor of the sampling, that organization's ESH Coordinator and the management of the building's occupants in the form of a written analysis documenting:

- Sampling and analysis methods,
- Contamination levels measured,
- Impact of the levels on regulatory compliance and occupant safety, and
- Recommendations on corrective actions (if corrective action is necessary).

Table 3

Compound	Acceptable Surface Contamination Level	Matrix/Qualifier	M/R	Source
Beryllium	3 ug/100cm ²	Housekeeping: Dust on surface	M	DOE 10 CFR 850.30
	3 ug/100cm ²	Release Criteria: to beryllium area	M	DOE 10 CFR 850.31
	0.2 ug/100cm ²	Release Criteria: to non-beryllium area	M	DOE 10 CFR 850.31
Lead	4.3 ug/100cm ² (40 ug/sq ft)	Floors	R1	EPA TSCA 403
	26.9 ug/100cm ² (250 ug/sq ft)	Interior Window Sills	R1	
Arsenic	15 ug/100cm ²	Housekeeping: Dust on surface	R2	BNL Best Management Practice based on DOE Beryllium
	1.0 ug/100cm ²	Release Criteria: to non-regulated area	R2	
Cadmium	3 ug/100cm ²	Housekeeping: Dust on surface	R2	BNL Best Management Practice based on DOE Beryllium
	0.2 ug/100cm ²	Release Criteria: to non-regulated area	R2	
Chromium III	70 ug/100cm ²	Housekeeping: Dust on surface	R2	BNL Best Management Practice based on DOE Beryllium
	3.3 ug/100cm ²	Release Criteria: to non-regulated area	R2	

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Compound	Acceptable Surface Contamination Level	Matrix/Qualifier	M/R	Source
Chromium VI	3 ug/100cm ²	Housekeeping: Dust on surface	R2	BNL Best Management Practice based on DOE Beryllium
	0.2 ug/100cm ²	Release Criteria: to non-regulated area	R2	
Nickel	200 ug/100cm ²	Housekeeping: Dust on surface	R2	BNL Best Management Practice based on DOE Beryllium
	10 ug/100cm ²	Release Criteria: to non-regulated area	R2	
PCB	10 ug/100cm ²	Unrestricted access area, liquid on surface	M	TSCA
	100 ug/100cm ²	TSCA restricted access area, liquid on surface	M	

M = Mandatory based on regulation applicable to BNL
 R1 = Recommended based on regulation not applicable to BNL
 R2 = Recommended based on analogy to Beryllium surface criteria

7.0 Implementation and Training

- 7.1 **Qualification Criteria:** Use of this SOP shall be limited to persons who have demonstrated the competency to satisfactorily use the procedure, as evidenced by experience and training, to the satisfaction of their supervision or existing qualification criteria set by their organization.
- 7.1.1 **For SHSD:** The IH Group will maintain a record of SHSD personnel who have passed the competency test listed in Attachment 8.2. If significant and substantive changes to the procedure are made, *Qualified Samplers* will be notified of the changes. IHG will re-qualify on a three year cycle.
- 7.1.2 **For other organizations:** The qualification criteria, re-qualification frequency, and record keeping for personnel are to be determined and documented by an organization's management.

8.0 References

- 8.1 NIOSH Manual of Analytical Method, Fourth Edition, Method 9100: *Lead in Surface Wipe Samples*, 8/15/94.
- 8.2 OSHA Instruction CPL 2-2.20B: *Sampling for Surface Contamination*, 2/5/90.
- 8.3 EPA: Toxic Substance Control Act (TSCA) 40CFR761.130.

The only official copy is on-line at the SHSD IH Group website.
Before using a printed copy, verify that it is current by checking the document issue date on the website.

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8.4 Ness, S.A.; *Surface and Dermal Monitoring for Toxic Exposures*, Van Nostrand Reinhold, 1994.

9.0 Attachments

- 9.1 Attachment 9.1: Surface Contamination Sampling Form
9.2 Attachment 9.2: SHSD Job Performance Measure (JPM) Completion Certificate

10.0 Documentation

Document Review Tracking Sheet		
<p>Prepared By: <i>Signature and date on file</i> R. Selvey, CIH 02/25/2000</p>	<p>Technical Reviewed By / Date: <i>Signature on file</i> N. Bernholc, CIH 02/27/00</p>	<p>SHSD Approved By / Date: <i>Signature on file</i> R. Selvey 03/02/2000</p>
<p>Technical Reviewed By / Date: <i>Signature on file</i> C. Weilandics, RCD- FS</p>	<p>RCD Review Committee 3-29-01</p>	<p>RCD Facility Support Approved By/ Date: <i>(Signature and date on file)</i> N. Foster 04/22/01 Procedure Committee Review</p>
<p>Filing Code: IH52QR.01</p>	<p>QA Review /Date: <i>Signature on file</i> E. Tucker</p>	<p>Effective Date: 03/02/2000</p>

Periodic Review Record		
Date of Review	Reviewer Signature and Date	Comments Attached
10/6/00	<i>(Signature and date on File)</i> Robert Selvey	Revised for minor correction noted in training classes
02/05/01	<i>(Signature and date on File)</i> Robert Selvey	Added new format, SBMS header and reviewed sections on Hazard assessment, PPE. Added Waste Disposal and Environmental Impact text.
03/09/01	<i>(Signature and date on File)</i> Robert Selvey	Minor format change. Converted SOP number from IH-FP-3.2 to new system IH75190.
04/22/01	<i>(Signature and date on file)</i> Robert Selvey	Revised to include RCD Facility Support Procedure Committee Review comments.

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04/10/02	(Signature and date on file) Robert Selvey	Updated Table 1 adding Arsenic and Cadmium Media. Update Table 3 with Arsenic and Cadmium Release Criteria and update EPA Lead Criteria
4/17/02	(Signature and date on file) Robert Selvey	Updated Table 1 to correct error in lead criteria. Insert Section 7 and transfer information from section 4. Renumber attachments.
08/16/02	(Signature and date on file) Robert Selvey	Added Best Management Practice release criteria for Arsenic and Cadmium to Table 3.
10/17/02	(Signature and date on file) Robert Selvey	Added Best Management Practice release criteria for Nickel to Table 3.
02/19/03	(Signature and date on file) Robert Selvey John Peters	Full review of SOP. Significant text changes. Deleted OSHA Method for procedure. Updated Attachments 9.1 and 9.2.

**Brookhaven National Laboratory
Safety & Health Service Division
Industrial Hygiene Group**

Surface Contamination Sampling Form

BNL-IH75190 Attachment 9.1 02/2003

Analyte:

<input type="checkbox"/>	LEAD
<input type="checkbox"/>	BERYLLIUM
<input type="checkbox"/>	CADMIUM
<input type="checkbox"/>	Other:

DEPT:

BUILDING:

**LOCATION NAME, ROOM NUMBER &
DESCRIPTION:**

Sample Media:

<input type="checkbox"/>	Ghost Wipe™
<input type="checkbox"/>	Cotton Gauze Size:
<input type="checkbox"/>	Filter Paper Type & Size:
<input type="checkbox"/>	Other:

Solvent:

<input type="checkbox"/>	Pre-Moistened
<input type="checkbox"/>	Distilled Water
<input type="checkbox"/>	Hexane
<input type="checkbox"/>	Iso-Propanol
<input type="checkbox"/>	Other:

Surface Area Measurement:

<input type="checkbox"/>	Template
<input type="checkbox"/>	Measured Area
<input type="checkbox"/>	Estimated Area
<input type="checkbox"/>	Other:

REASON FOR SAMPLING:

☐ Area Characterization
☐ Pre-Remediation
☐ Post Remediation

Other:

Sample Identification

Sample Number				Sample Location	Surface Type <small>Metal / Plastic / Glass / Painted Wood / Wood / Painted Concrete / Concrete</small>	Surface Area
Bldg#	MMDDYY	Sample #	Analyte Symbol			
						_____ 1 ft ² _____ 100 cm ² other: _____
						_____ 1 ft ² _____ 100 cm ² other: _____
						_____ 1 ft ² _____ 100 cm ² other: _____
						_____ 1 ft ² _____ 100 cm ² other: _____

___ Additional Samples next page

Total Number of Samples: _____

SAMPLE DATE:

SAMPLES TAKEN BY: (Print Name and Signature)

/

RELINQUISHED TO SHSD IH LAB BY: (SIGNATURE):

**RECEIVED BY SHSD IH LAB EMPLOYEE
(SIGNATURE):**

DATE /TIME:

/

DATE /TIME:

/

Sample Number				Sample Location	Surface Type Metal / Plastic / Glass / Painted Wood / Wood / Painted Concrete / Concrete	Surface Area
Bldg#	MMDDYY	Sample #	Analyte Symbol			
						____ 1 ft ² ____ 100 cm ² other: _____
						____ 1 ft ² ____ 100 cm ² other: _____
						____ 1 ft ² ____ 100 cm ² other: _____
						____ 1 ft ² ____ 100 cm ² other: _____
						____ 1 ft ² ____ 100 cm ² other: _____
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						____ 1 ft ² ____ 100 cm ² other: _____
						____ 1 ft ² ____ 100 cm ² other: _____
						____ 1 ft ² ____ 100 cm ² other: _____
						____ 1 ft ² ____ 100 cm ² other: _____

SAMPLE DATE:

SAMPLES TAKEN BY: (Print Name and Signature)
/

RELINQUISHED TO SHSD IH LAB BY: (SIGNATURE):

RECEIVED BY SHSD IH LAB EMPLOYEE
(SIGNATURE):DATE /TIME:
/DATE /TIME:
/

Chemical Surface Wipe Sampling Job Performance Measure (JPM) Completion Certificate

Candidate's Name	Life Number:	Qualification Number: HP-IHP- 75190
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Knowledge of the Principles of Surface Wipe Sampling

Demonstrated by Written Exam

Criteria	Qualifying Standard
Hazard Analysis	Understands the need to perform a hazard analysis of the sampling area and potential exposure to the sampler.
Personal Protective Equipment	Understands the need to be aware of the potential surface contamination and airborne levels of contaminants and knows how to determine the need for PPE.
Sampling Protocol	Understands the exposure monitoring logic necessary to appropriately select sampling locations to accurately measure worker, public and environmental exposure potential.
Analysis of data	Understands the need to perform analysis on the sampling data to assess potential exposure to the sampler, worker, public and environment, and to recommend corrective actions as necessary.

Practical Skill Evaluation: Demonstration of Surface Wipe Methodology

Criteria	Qualifying Performance Standard	Unsat.	Recov.	Satisf.
Sampling Equipment	Knows where equipment needed for the procedure is located and how to properly sign it out.			
Moistening Media	a. Filter/gauze: Moistens media with the appropriate solvent. Applies solvent to moisten approximately 80% of the area of the media. Does not over moisten. b. For pre-moistened media, shows reduction in size of wipe.			
Size of Area & Use of Template	Understands the importance of quantifying the area sampled. Demonstrates placing template on surface or measuring the surface area.			
Folding Media at each wipe step	Demonstrates the inward folding of media after each wipe and placement of media into container so that surfaces loaded in the wiping are not exposed.			
NIOSH Method wipe pattern	Demonstrates the technique of three passes of wiping in "S" pattern, changing the direction on second pass, original direction on third pass.			
Choose correct solvent	Knows how to select correct solvent from Table 1.			
Select the correct number of samples	Knows how to choose the appropriate numbers of samples based on Table 2.			
Record forms	Shows how to correctly and completely fill all forms associated with this SOP.			

I accept the responsibility for performing this task as demonstrated within this JPM and the corresponding SOP.

Candidate Signature:	Date:
----------------------	-------

I certify the candidate has satisfactorily performed each of the above listed steps and is capable of performing the task unsupervised.

Evaluator Signature:	Date:
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